JIS G3141 Cold-reduced carbon steel sheets and strip

1. Scope

This Japanese Industrial Standard specifies the cold-reduced carbon steel sheets, coils and strip (hereafter referred to as "steel sheet and coil"), including the cold rolled strip steel (steel coils less than 500 mm in width during cold rolling) and also the cut lengths there from.

Remarks

1. The standard cited in this Standard are given in Attached Table 1.
2. The International Standard corresponding to this Standard is given in the following:

ISO 3574-1986 Cold-reduced carbon steel sheet of commercial and drawing qualities

3. A part of the corresponding International Standard listed in this Standard is given in the Annex. This Annex is applicable instead of the requirements specified in 1., 2., 3. and 10. of this text.

2. Quality and symbol

The steel sheet and coil shall be classified into three categories and their symbols shall be as given in Table 1, They shall be subclassified according to the temper grade and surface finish as given in Tables 2 and 3, respectively.

Table 1. Symbol of quality

Symbol of quality	Remarks
SPCC	Commercial quality
SPCD	Drawing quality
SPEC	Deep drawing quality

Remarks

1. When the steel sheet and coil of standard temper grade and as-annealed on in quality SPCC are requested by the purchaser to guarantee tensile test values, letter symbol T shall be suffixed to the symbol of quality, thus appears SPCCT.
2. When the steel sheet and coil of standard temper grade in quality SPEC are requested by the purchaser to guarantee non-aging property, letter symbol N shall be suffixed to the symbol of quality, thus appears SPCEN.

Table 2. Temper grade

Temper grade	Symbol of temper grade
As-annealed	A
Standard temper grade	S

1/8 hard	8
1/4 hard	4
1/2 hard	2
Full hard	1

Table 3. Surface finish

Surface finish	Symbol of surface finish	Remarks
Dull finish	D	A matt finish produced with a roll roughened its surface mechanically or chemically
Bright finish	B	A smooth finish produced with a roll finished its surface smoothly

Remarks: This sable is not applicable to the steel sheet and coil as-annealed.

3. Mechanical properties

3.1 Tensile strength, elongation and non-aging property

The steel sheet and coil of standard temper grade and as-annealed one shall be tested in accordance with 10., and their tensile strength, elongation and non-aging properties shall be as given in Table 4.

Table 4. Tensile strength, elongation and non-aging property

Symbol of quality	Tensile strength N/mm	Elongation %						Tensile test piece
	Discrimination according to nominal thickness mm							
	0.25 or over	0.25 or over to and excl. 0.40	0.40 or over to and excl. 0.60	0.60 or over to and excl. 1.0	1.0 or over to and excl. 1.6	1.6 or over to and excl. 2.5	2.5 or over	
SPCC	(270 min.)	(32 min.)	(34 min.)	(36 min.)	(37 min.)	(36 min.)	(39 min.)	No. 5, in rolling direction
SPCD	270 min.	34 min.	36 min.	38 min.	39 min.	40 min.	41 min.	
SPCE	270 min.	36 min.	38 min.	40 min.	41 min.	42 min.	43 min.	

Remarks

1. The tensile test value, as a rule, is not applicable to SPCC. When specified (SPCCT)by the purchaser, however, the values in parentheses shall be applied.
2. For those less than 0.60 mm in thickness, as a rule, the tensile test shall be omitted.
3. This table is applicable to those of 30 mm or over in width.
4. When the steel sheet and coil of standard temper grade in quality SPCE are specified non-aging property (SPCEN), this shall be guaranteed for six months after shipment from the manufacturer's factory.

3.2 Hardness

The steel sheet and coil of grades 1/8 hard, 1/4 hard, 1/2 hard and full hard shall be tested in accordance with 10. and their hardness shall be as given in Table 5.

Table 5. Hardness

Temper grade	symbol of temper grade	Hardness	
		HRB	HV
1/8 hard	8	50 to 71	95 to 130
1/4 hard	4	65 to 80	115 to 150
1/2 hard	2	74 to 89	135 to 185
Full hard	1	85 min.	170 min.

Remarks: As to hardness, either HRB or HV shall be applied.

3.3 Bendability

The steel sheet and coil of SPCC shall be tested in accordance with 10. and the bendability shall be as given in Table 6. In this case, the test piece shall withstand being bent without cracking on the outside of the bent portion.

However, for the steel sheet and coil of grades 1/8 hard, 1/4 hard and 1/2 hard, the bend test shall be carried out on request by the purchaser.

Table 6. Bendability

Temper grade	Symbol of temper grade	Bend test		
		Bend angle	Inside radius	Bend test piece
As-annealed	A	180°	Flat on itself	No. 3 test piece, in the rolling direction
Standard temper grade	S	180°	Flat on itself	
1/8 hard	8	180°	Flat on itself	
1/4 hard	4	180°	Thickness X 0.5	
1/2 hard	2	180°	Thickness X 1.0	
Full hard	1	-	-	

Remarks: The bend test may be omitted for the steel sheet and coil of as-annealed and of standard temper grade.

4. Expression of size

The size of the steel sheet and coil shall be expressed as follows:

(1) The size of the steel sheet shall be expressed by thickness, width and length in millimeter, respectively.

(2) The size of the steel coil shall be expressed by thickness and width in millimeter, respectively.

5. Standard dimensions

The standard thickness of the steel sheet and coil 500 mm or over in width during cold rolling shall be as given in Table 7.

Table 7. Standard dimensions

Unit: mm

Standard thickness	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.2	1.4
	1.6	1.8	2.0	2.3	2.5	(2.6)	2.8	(2.9)	3.2

Remarks: The standard thickness not in parentheses should preferably be used.

6. Dimensional tolerances

6.1 Position of measurement on dimensions

The position of measurement on dimensions shall be as follows:

(1) For the steel sheet and regular portion of the steel coil, measurement on thickness shall be made at any point not less than 15 mm apart from both side edges. In the case where the width is less than 30 mm, however, the measurement shall be made at a mid-width position.

(2) Measurement on width shall be made at regular portion for the steel coil and at any place for the steel sheet.

(3) Measurement on length shall be made at any place for the steel sheet.

6.2 Thickness tolerances

The thickness tolerances shall be as follows:

(1) The thickness tolerances shall be applied to the nominal thickness.

(2) The thickness tolerances shall be classified into classes A and B as given in Table 8 and Table 9, respectively.

Table 8. Thickness tolerances, class A

Unit: mm

Discrimination according to nominal thickness	Discrimination according to nominal width				
	Under 630	630 or over to and excl. 1000	1000 or over to and excl. 1250	1250 or over to and excl.1600	1600 or over
Under 0.25	【 0.03	【 0.03	【 0.03	-	-
0.25 or over to and excl. 0.40	【 0.04	【 0.04	【 0.04	-	-
0.40 or over to and excl. 0.60	【 0.05	【 0.05	【 0.05	【 0.06	-

0.06 or over to and excl. 0.80	【 0.06	【 0.06	【 0.06	【 0.06	【 0.07
0.80 or over to and excl. 1.00	【 0.06	【 0.06	【 0.07	【 0.08	【 0.09
1.00 or over to and excl. 1.25	【 0.07	【 0.07	【 0.08	【 0.09	【 0.11
1.25 or over to and excl. 1.60	【 0.08	【 0.09	【 0.10	【 0.11	【 0.13
1.60 or over to and excl. 2.00	【 0.10	【 0.11	【 0.12	【 0.13	【 0.15
2.00 or over to and excl. 2.50	【 0.12	【 0.13	【 0.14	【 0.15	【 0.17

Table 8. (Continued)

Discrimination according to nominal thickness	Discrimination according to nominal width				
	Under 630	630 or over to and excl.1000	1000 or over to and excl.1250	1250 or over to and excl.1600	1600 or over
2.50 or over to and excl. 3.15	【 0.14	【 0.15	【 0.16	【 0.17	【 0.20
3.15 or over	【 0.16	【 0.17	【 0.19	【 0.20	-

Table 9. Thickness tolerances, class B

Unit: mm

Discrimination according to nominal thickness	Discrimination according to nominal width			
	Under 160	160 or over to and excl. 250	250 or over to and excl. 400	400 or over to and excl. 630
Under 0.10	【 0.010	【 0.020		
0.10 or over to and excl. 0.16	【 0.015	【 0.020		
0.16 or over to and excl. 0.25	【 0.020	【 0.025	【 0.030	【 0.030
0.25 or over to and excl. 0.40	【 0.025	【 0.030	【 0.035	【 0.035
0.40 or over to and excl. 0.60	【 0.035	【 0.040	【 0.040	【 0.040
0.60 or over to and excl. 0.80	【 0.40	【 0.045	【 0.045	【 0.045
0.80 or over to and excl. 1.00	【 0.04	【 0.05	【 0.05	【 0.05
1.00 or over to and excl. 1.25	【 0.05	【 0.05	【 0.05	【 0.06

1.25 or over to and excl. 1.60	± 0.05	± 0.06	± 0.06	± 0.06
1.60 or over to and excl. 2.00	± 0.06	± 0.07	± 0.08	± 0.08
2.00 or over to and excl. 2.50	± 0.07	± 0.08	± 0.08	± 0.09
2.50 or over to and excl.	± 0.05	± 0.09	± 0.09	± 0.10
0.25 or over to and excl. 0.40	± 0.09	± 0.10	± 0.10	± 0.11

6.3 Width tolerances

The width tolerances shall be as follows:

(1) The width tolerances shall be applied to the nominal width.

(2) The width tolerances shall be classified into classes A, B and C as given in Table 10, Table 11 and Table 12, respectively.

Table 10. Width tolerances, class A

Unit: mm

Discrimination according to nominal width	
Under 1250	1250 or over
+7	+10
0	0

Remarks: The plus side tolerances shall not be applied to the stretcher-leveled steel sheet.

Table 11. Width tolerances, class B

Unit: mm

Discrimination according to nominal width	
Under 1250	1250 or over
+3	+4
0	0

Table 12. Width tolerances, class C

Unit: mm

Discrimination according to nominal	Discrimination according to nominal width

thickness	Under 160	160 or over to and excl. 250	250 or over to and excl. 400	400 or over to and excl. 630
Under 0.60	【 0.15	【 0.20	【 0.25	【 0.30
0.60 or over to and excl. 1.00	【 0.20	【 0.25	【 0.25	【 0.30
0.60 or over to and excl. 1.00	【 0.20	【 0.30	【 0.30	【 0.40
0.60 or over to and excl. 1.00	【 0.25	【 0.35	【 0.40	【 0.50
0.60 or over to and excl. 1.00	【 0.30	【 0.40	【 0.45	【 0.50
0.60 or over to and excl. 1.00	【 0.40	【 0.50	【 0.55	【 0.65

6.4 Length tolerances

The length tolerances shall be as follows:

(1) The length tolerances shall be applied to the nominal length of the steel sheet.

(2) The tolerances on length shall be classified into classes A and B as given in Table 13 and Table 14, respectively.

Table 13. Length tolerances, class A

Unit: mm

Discrimination according to nominal length	Tolerances
Under 2000	+100 0
2000 or over to and excl. 4000	+15 0
4000 or over to and excl. 6000	+20 0

Remarks: The plus side tolerances shall not be applied to the stretcher-leveled steel sheet.

Table 14. Length tolerances, class B

Unit: mm

Discrimination according to nominal length	Tolerances
Under 1000	+3 0
1000 or over to and excl. 2000	+4 0

2000 or over to and excl. 3000	+6 0
3000 or over to and excl. 4000	+8 0

7. Shape

7.1 Flatness

The flatness tolerances shall be classified into class A and class B as given in Table 15 and Table 16, respectively. These tables shall be applied to the steel sheet of standard temper grade which is 500mm or over in width during cold rolling.

Remarks: Flatness shall be measured by lying a steel sheet under its own mass on a flat surface plate, and the value of flatness shall be determined as the difference between the maximum deviation of convex from the flat surface and the nominal thickness of the steel sheet when its convex side is uppermost.

Table 15. Maximum deviation from flatness, class A

Unit: mm

Discrimination according to nominal width	Classification of shape-irregularity		
	Bow, wave	Edge wave	Center buckle
Under 1000	12	8	6
1000 or over to and excl. 1250	15	9	8
1250 or over to and excl. 1600	15	11	8
1600 or over	20	13	9

Table 16. Maximum deviation from flatness, class B

Unit: mm

Discrimination according to nominal width	Classification of shape-irregularity		
	Bow, wave	Edge wave	Center buckle
Under 1000	2	2	2
1000 or over to and excl. 1250	3	2	2
1250 or over to and excl. 1600	4	3	2
1600 or over	5	4	2

Remarks: The flatness, class B shall generally be applied to the stretcher-leveled steel sheet.

7.2 Camber

The camber for the steel sheet and coil shall be as given in Table 17.

Table 17. Maximum value of camber

Unit: mm

Discrimination according to nominal width	Product form, coil or cut-length		
	Cut lengths		coil
	Under 1000 in length	2000 or over in length	
30 or over to and excl. 60	8	8 in any 2000 length	
60 or over to and excl. 630	4	4 in any 2000 length	
630 or over	2	2 in any 2000 length	

Remarks: The values specified in this table shall not be applied to the irregular portion of the steel coil.

8. Mass

8.1 Mass of steel sheet

The mass of the steel sheet shall be as follows:

(1) The mass of the steel sheet shall be expressed in kilogram. The theoretical mass shall generally be applied for the steel sheet 500 mm or more in width during cold rolling, and the actual mass shall be applied for the steel sheet under 500 mm in width during cold rolling.

(2) The method for calculation of mass of the steel sheet shall be in accordance with Table 18 using the nominal dimensions.

(3) The standard mass of a single bundle of the steel sheet 500 mm or more in width shall be 2000 kg, 3000 kg and 4000 kg.

Table 18. Calculation procedure of theoretical mass

Sequence of calculation	Calculation method	Rounding off rule of calculated result
Basic mass kg/mm.m	7.85 (mass per mm thickness per m area)	-
Unit mass kg/m	Basic mass (kg/mm.m) X thickness (mm)	Rounded off to 4 significant figures.
Area of steel sheet m	Width (m) X length (m)	Rounded off to 4 significant figures.
Mass of single sheet kg	Unit mass (kg/m) X area(m)	Rounded off on 3 significant figures.
Mass of single bundle kg	Mass of single sheet (kg) X number of sheets per bundle of same size	Rounded off to integer in kg.
Total mass kg	Sum of mass of each bundle	Integer in kg

Remarks

1. The total mass may be calculated by multiplying the mass of a single sheet (kg)by the total number of sheets.

2. Rounding off of the numerical values shall be in accordance with JIS Z 8401.

8.2 Mass of steel coil

The mass of the steel coil shall be as follows:

(1) The mass of the steel coil shall be the actual one expressed in kilograms.

(2) For the mass of the steel coil, the maximum mass of each coil shall generally be designated, and the specified maximum mass shall usually be not less than the following values:

(a) For the steel coil of 500 mm or more in width; 3 kg/mm of width

(b) For the steel coil less than 500 mm in width; 1 kg/mm of width

9. Appearance

The appearance shall be as follows:

(1) The steel sheet and coil shall be oiled, unless otherwise specified.

(2) The steel and coil shall be free from such defects as hole, lamination and other imperfections that are detrimental to practical use. Provisions on defects other than hole and lamination, however, shall generally be applied to one side of the surface (1) of the steel sheet and coil.

For the steel coil, however, some irregular portions and welds may be included therein, since generally the steel coil is afforded no opportunity to inspect readily and to remove such defective parts.

Note(1)

The term "one side of the surface" means, as a rule, the top of each package for the steel sheet and the outside surface for the steel coil.

(3) For the steel sheet and coil of as-annealed grade the coil break, edge wave, etc. caused by omission of skin pass shall not be regarded as detrimental defects.

(4) For the unoiled steel sheet and coil, the rust, scratch, etc. caused by omission of oiling shall not be regarded as detrimental defects.

10. Mechanical test

10.General requirements for mechanical test

The general requirements for mechanical testing shall be in accordance with the specifications in 4. (Mechanical properties) of JIS G 0303. With this respect, the sampling method of specimen shall conform to class A, and number of test pieces and the sampling position shall be as follows:

(1) Number of test pieces

One test piece shall be taken from each steel coil defined in cold rolling process (hereafter referred to as "coil").

In the case where the mass of the single coil is less than 3 t, one test piece shall be taken from each lot of the same heat, rolled to the same thickness under the same rolling conditions and the same heat treatment conditions.

(2) Sampling position of test piece

The center of each test piece shall be at a quarter-width. When it is infeasible, however, the sampling should be made a close to the aforementioned position a possible.

10.2 Test piece and test method

10.2.1 Tensile test

The tensile test shall be carried out as given in the following:

(1) As to a test piece, No. 5 test piece specified in JIS Z 2201 shall be used.

(2) The test method shall be as specified in JIS Z 2241.

10.2.3 Hardness test

The test shall be as specified in JIS Z 2244 or JIS Z 2245.

10.2.4 Bend test

The bend test shall be carried out as given in the following:

(1) As to a test piece, No. 3 test piece specified in JIS Z 2204 shall be used.

(2) The test method shall be as specified in JIS 2248.

11. Inspection

The inspection shall be carried out as follows:

(1) General requirements for inspection shall be as specified in JIS G 0303.

(2) The mechanical properties shall conform to the requirements specified in 3.

(3) The dimensional tolerances shall conform to the requirements specified in 6.

(4) The shape shall conform to the requirements specified in 7.

(5) The mass shall conform to the requirements specified in 8.

(6) The appearance shall conform to the requirements specified in 9.

12. Packaging and marking

The steel sheet and coil which have passed the inspection shall, as a rule, be packed and clearly marked with the following details by suitable means. When approved by the purchaser, however, a part of the details given below may be omitted.

(1) Symbol of quality

(2) Symbol of temper grade

(3) Symbol of surface finish

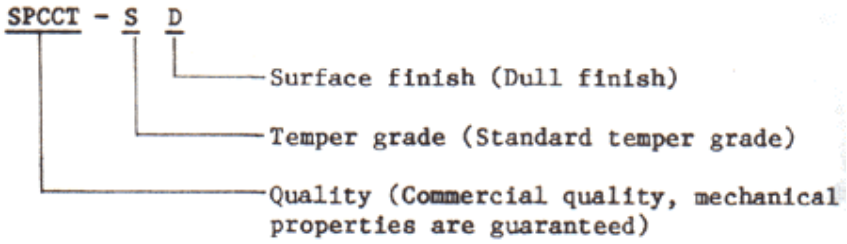
(4) Manufacture number or inspection number

(5) Dimensions

(6) Number of sheets or mass (this may be omitted for the strip steel and cut lengths therefrom which are cold-rolled under 500 mm in width)

(7) Manufacturer's name or its identifying brand

Remarks: An example of marking on symbols of quality, temper grade and surface finish



Attached Table 1. Cited standards

JIS G0303	General rules for inspection of steel
JIS Z2201	Test pieces for tensile test for metallic materials
JIS Z2204	Bend test pieces for metallic materials
JIS Z2241	Method of tensile test for metallic materials
JIS Z2244	Method of Vickers hardness test
JIS Z2245	Method of Rockwell and Rockwell superficial hardness test
JIS Z2248	Method of bend test for metallic materials
JIS Z8401	Rules for rounding off of numerical values
JIS Z1024	Metallic materials - Hardness test - Rockwell superficial test (scales 15N, 30 N, 45 N, 15 T, 30 T and 45T)
JIS Z6507-1	Metallic materials - Hardness test - Vickers test - Part 1: HV5 to HV100
JIS Z6508	Metallic materials - Hardness test - Rockwell test (scales A-B-C-D-E-F-G-H-K)
JIS Z6892	Metallic materials - Tensile testing
JIS Z7438	Metallic materials - Bend test

Annex Cold-reduced carbon steel sheet of commercial and drawing qualities

Foreword

This Annex has been made out based on the scope, references, chemical composition, mechanical properties, sampling and mechanical property tests specified in ISO 3574-1986 (Cold-reduced carbon steel sheet of commercial and drawing qualities) which corresponds to the text of this Standard.

It is not allowed to apply only a part of this Annex instead of the requirements specified in the text.

1. Scope and field of application

1.1 This Annex applies to cold-reduced carbon steel sheet of commercial and drawing qualities. It is suitable for applications where surface is of prime importance.

1.2 Commercial quality sheet (CRI)is intended for general fabricating purposes where sheet is used in the flat or for bending, moderated forming, and welding operations. It is produced in thickness of 0.36 mm and thicker (commonly produced up to 4 mm) and in widths of 600 mm and over, in coils and cut lengths.

1.3 Drawing quality sheet (CR2, CR3, CR4) is intended for drawing or severe forming, including welding. It is produced in thicknesses of 0.36 mm and thicker (commonly produced up to 4 mm) and in widths of 600 mm and wider, in coils and cut lengths.

Drawing qualities are identified as follows:

CR2 - drawing quality

CR3 - deep drawing quality

CR4 - deep drawing quality special killed (non-aging)

1.4 Cold-reduced sheet less than 600 mm wide may be slit from wide sheet and will be considered as sheet.

2. References

ISO 1024	Metallic materials - Hardness test -Rockwell superficial test (scales 15 N, 30 N, 45 N, 15 T, 30 T and 45 T)
ISO 6507-1	Metallic materials - Hardness test - Vickers test - Part 1 : HV5 TO HV100
ISO 6508	Metallic materials - Hardness test - Rockwell test (scales A-B-C-D-E-F-G-H-K)
ISO 6892	Metallic materials - Tensile testing
ISO 7438	Metallic materials - Bend test

3. Chemical composition

The chemical composition (cast analysis) shall not exceed the values given in Annex Table 1.

Annex Table 1. Chemical composition (cast analysis)

Values and percentages by mass

Quality Designation	Name	C	Mn	P	S
CR1	Commercial	0.15 max.	0.60 max.	0.05 max.	0.05 max.
CR2	Drawing	0.12 max.	0. 50 max.	0.04 max.	0.04 max.

CR3	Deep drawing	0.10 max.	0.45 max.	0.03 max.	0.03 max.
CR4	Deep drawing special killed (non-aging)	0.08max.	0.45 max.	0.03 max.	0.03 max.

4. Mechanical properties

The mechanical properties shall be as given in dance with the requirements of clause 6.

The values specified in Annex Table 3 are applicable for the periods indicated in Annex Table 2 from the time that the steel is available for shipment.

Annex Table 2. Applicable period for values specified in Annex Table 3

Designation	Period
CR2	8 days
CR3	8 days
CR4	6 months

Annex Table 3. Mechanical property requirements for cold-reduced carbon steel sheet

Quality		Tensile strength N/mm (1)	Elongation (2) %		Radius of 180° bend		Hardness (3)	
Designation	Name		Gauge length		Thickness		HRB	HR30T
			80 mm	50 mm	Up to and excl. 3 mm	3mm or over	HRB	HR30T
CR1	Commercial	-	-	-	Flat on itself	Thickness X 0.5	- (4)	-
CR2	Drawing	370 max.	30 min.	31 min.	-	-	57 max.	55 max.
CR3	Deep drawing	350 max.	34 min.	35 min.	-	-	53 max.	52 max.
CR4	Deep drawing special killed (non-aging)	340 max.	36 min.	37 min.	-	-	50 max.	50 max.

Notes

(1) Minimum tensile strength for qualities CR2, CR3, and CR4 would normally be expected to be 270 N/mm. All tensile strength values are determined to the nearest 10 N/mm.

(2) For the material up to and including 0.6 mm in thickness, the elongation values in the table shall be reduced by 1. Minimum elongation values on a gauge length of (So : original cross sectional area of gauge length)of a test piece may be the subject of agreement between the purchaser and supplier.

(3) HRB: hardness Rockwell B scale

HR30T: hardness Rockwell 30T scale

Equivalent Vickers hardness values are allowed on agreement between the purchaser and supplier at the time of ordering. By agreement between the interested parties mentioned beforehand, no hardness requirements need apply. The hardness of sheet thinner than 0.6 mm shall be measured exclusively in compliance with the HR30T scale.

(4) The hardness of quality CR1 steel sheet is expected not to exceed the equivalent of Rockwell HRB65 at the time it is made available for shipment.

5. Sampling

5.1 Tensile and hard tests

One representative sample for the tensile test (that is also to be used for the hardness test) required in Annex Table 3 shall be taken from each lot of sheet for sheet for shipment. A lot consists of 50 t or less of sheet of the same quality rolled to the same thickness and condition.

5.2 Bend test

One representative sample for the bend test (applicable only to CR1) shall be taken from each lot of sheet for shipment. A lot consists of all sheet of the same quality rolled to the same thickness and condition.

6. Mechanical property tests

6.1 Tensile test

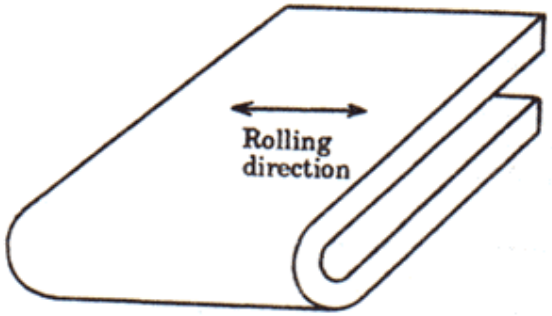
The tensile test shall be carried out in accordance with ISO 6892. Transverse test piece shall be taken midway between the center and edge of the sheet as rolled.

6.2 Bend test

(applicable only to CR1) The transverse bend test piece shall withstand being bent through 180。 , in the direction shown in Annex Fig. 1 and around an inside radius as give in Annex Table 3, without cracking on the outside of the bent portion. The bend test shall be carried out at ambient temperature and in accordance with ISO 7438.

Shall cracks on the edges of test pieces, and cracks not visible to the naked eye, shall be disregarded.

Annex Fig. 1. Transverse bend test piece (after bending)



6.3 Hardness test

The hardness test shall be carried out in accordance with ISO 1024, ISO 6507-1 or ISO 6508 on the test pieces specified in 6.1.

Informative reference

Introduction

This Informative reference gives the supplement to the chemical composition and mechanical properties, and matters to be attended at the time of contract, but does not form part of this Standard.

1. Chemical composition

The chemical composition (cast analysis values shall be as given in Informative reference Table 1.

Informative reference Table 1. Chemical composition

Unit: %

Symbol of quality	C	Mn	P	S
SPCC	0.12 max.	0.05 max.	0.040 max.	0.045 max.
SPCD	0.10 max.	0.45 max.	0.035 max.	0.035 max.
SPCE	0.08 max.	0.40 max.	0.030 max.	0.030 max.

Remarks:

For the steel sheet and coil of grades 1/8hard, 1/4 hard, 1/2 hard and full hard, increment of hardness is achieved sometimes by changing their chemical composition instead of by temper rolling.

2. Mechanical properties

2.1 The combination of the symbol of quality, temper grade and surface finish, and items of mechanical properties to be applied shall be as given in Informative reference Table 2.

Informative reference Table 2. Applicable items of mechanical properties

Symbol of quality	Temper grade	Discrimination of surface finish	Symbol	Tensile test value	Non-aging property	Bending	Hardness
SPCC	As-annealed	-	SPCC-A	-	-	O	-
	As-annealed(when specified to guarantee mechanical properties)	-	SPCCT-A	O	-	O	-
	Standard temper grade	Dull finish	SPCC-SD	-	-	O	-
		Bright finish	SPCC-SB				
	Standard temper grade (when specified to guarantee mechanical properties)	Dull finish	SPCCT-SD	O	-	O	-
		Bright finish	SPCCT-SB				
	1/8 hard	Dull finish	SPCC-8D	-	-	≦	O

		Bright finish	SPPCC-8B				
	1/4 hard	Dull finish	SPCC-4D	-	-	≤	O
		Bright finish	SPCC-4B				
	1/2 hard	Dull finish	SPCC-2D	-	-	≤	O
		Bright finish	SPCC-2B				
	Full hard	Dull finish	SPCC-1D	-	-	-	O
		Bright finish	SPCC-1B				
SPCD	As-annealed	-	SPCD-A	O	-	-	-
	Standard temper grade	Dull finish	SPCD-SD	O	-	-	-
		Bright finish	SPCD-SB				
SPCE	As-annealed	-	SPCE-A	O	-	-	-
	Standard temper grade	Dull finish	SPCE-SD	O	-	-	-
		Bright finish	SPCE-SB				
	Standard temper grade (when specified to guarantee on-aging property)	Dull finish	SPCEN-SD		O	-	-
		Bright	SPCEN-SB				

Remarks

1. Tensile test value

(1) The tensile test shall be applied to the grade marked with O in Informative reference Table 2.

(2) Since the tensile test is generally omitted for the steel sheet 0.25 mm or over to 0.60 mm exclusive in thickness, the purchaser shall specify a tensile test, when necessary.

2. Non-aging property

The non-aging property shall be applied to the grade marked with O in Informative reference Table 2.

3. Bend test

(1) Although the bend test shall be applied to the grade marked with O in Informative reference Table 2, this test may be omitted.

(2) The bend test is carried out to the grade marked with ≤ in Informative reference Table 2 on request by the purchaser.

4. Hardness

The hardness test shall be applied to the grade marked with O in Informative reference Table 2.

5. Others

(1) In addition to those listed in Informative reference Table 2,grades 1/8 hard, 1/4 hard, 1/2 hard or full hard may be specified in qualities SPCD and SPCE, respectively. The

applicable items of the mechanical property in this case shall be the same as those of SPCC.

(2) Application of other test items (such as Erichsen test value and conicalcup test value)which are not specified in Informative reference Table 2, shall be agreed upon between the purchaser and supplier.

2.2 The hardness of the steel sheet and coil of standard temper grade and of as-annealed, and the tensile test values of grades 1/8 hard, 1/4 hard, 1/2 hard and full hard shall be as given in Informative reference Tables 3 and 4, respectively.

Informative reference Table 3. Hardness of standard temper grade and of as-annealed, and the tensile test values of grades 1/8 hard, 1/4 hard, 1/2 hard and full hard shall be as given in Informative reference Tables 3 and 4, respectively.

Informative reference Table 3. Hardness of standard temper grade and of as-annealed

Temper grade	Symbol	Hardness	
		HRB	HV
As-annealed	A	57 max.	105 max.
Standard temper grade	S	65 max.	115 max.

Informative reference Table 4. Tensile test values of 1/8 hard, 1/4 hard, 1/2 hard and full hard, 1/4 hard, 1/2 hard and full hard

Temper grade	Symbol	Tensile strength N/mm	Elongation %	Test piece
1/8 hard	8	290 to 410	25 min.	No. 5, in the rolling direction
1/4 hard	4	370 to 490	10 min.	
1/2 hard	2	440 to 590	-	
Full hard	1	550 min.	-	

Remarks: Informative reference Table 4 gives the Values for the thickness of 0.25 mm or over and for the width of 30 mm or over.

3. Matters to be attended at the time of contract

It is recommended that the purchaser specifies the following items at the times of contract.

3.1 General matters to be specified at the time of ordering

(1) Product form, coil or cut lengths(1)

(2) Symbol of quality

(3) Symbol of temper grade

(4) Symbol of surface finish

(5) Dimensions

(6) Quantity

(7) Mass of bundled steel sheets (if required)
(8) Allowable range on total quantity of shipment in comparison with ordered quantity
(9) Date and method of delivery and destination
(10) Maximum mass of single coil
(11) Inside diameter of coil (if required)
(12) Designation of unoiling (if required)
(13) Use
Note (1) For the steel in coil form and cut lengths there from which have been cold rolled under 500 mm in width, they shall be designated as the "cold rolled strip steel" at the time of ordering.
3.2 Mechanical properties
At the time of ordering, the specification items shall be in accordance with Informative reference Table 2 and its remarks.
3.3 Temper rolling and surface finish
The steel sheet and coil are supplied in the following conditions, unless otherwise specified:
(1) The coil cold rolled 500 mm or more in width and cut lengths:
Standard temper grade and dull finish
(2) The strip cold rolled under 500 mm in width and cut lengths:
Standard temper grade and bright finish
3.4 Dimensional tolerance and flatness
Unless otherwise specified, the dimensional tolerances and flatness mentioned below are applied. In other cases, specific class (es) shall be designated.
(1) The coil cold rolled 500 mm or more in width and cut lengths:
Thickness tolerance, class A, width tolerance, class A length tolerance, class A, and flatness, class A
(2) The strip cold rolled under 500 mm in width and cut lengths:
Thickness tolerance, class B, width tolerance, class B, and length tolerance, class B
3.5 Others
Where denotation of the date of skin pass for the standard temper grade is necessary, this matter shall be specifically designated.